DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

OPEN-FILE REPORT 87-515
SHEET 1 OF 1

INTRODUCTION

The Taylor Creek Rhyolite is part of the Mogollon-Datil Volcanic Field, a 10,000 km^3 accumulation of mafic to silicic lava flows and pyroclastic rocks principally of mid-Tertiary age (Ratte, 1987). The volcanic field includes several calderas that formed in response to eruptions of large volumes of pyroclastic products, and it is characterized by a Bouguer gravity low interpreted to reflect an underlying composite granitic batholith, the intrusive roots of the volcanic rocks. The Taylor Creek Rhyolite crops out near the geographic center of the volcanic field as expressed by the gravity signature and apparently is not associated with a caldera (Ratte and others, 1984). This rhyolite was named by Elston (1976) for outcrops along Taylor Creek, Sierra County, New Mexico. Subsequently, the name has been applied to rhyolite of similar lithologic appearance in outcrops isolated many miles from the type locality (e.g. Correa, 1981; Lawrence, 1985; Eggleston and Norman, 1983). This broad usage of the name seemingly was anticipated by Fries and Butler (1943), who first mapped "porphyritic tin-bearing rhyolite", a unit that has since become the Taylor Creek Rhyolite with very little modification to their originally mapped distribution. We continue the broad use of the Taylor Creek name, and apply it to the twenty separately mapped lava flows discussed in this report.

The most striking characteristic of this rhyolite is its remarkably uniform appearance in the field; most of the twenty lava flows are indistinguishable from one another in outcrop and hand sample. The rhyolite is flow foliated and contains subequal amounts of quartz and sanidine phenocrysts in a devitrified groundmass; it is distinctly different from all nearby volcanic lithologies, and it locally contains cassiterite-bearing veins and/or is the source of nearby cassiterite placer deposits. These common characteristics, easily seen in outcrops over a wide area, undoubtedly prompted the first mappers, Fries and Butler (1943), to assign the rhyolite to a single map unit. Subsequent studies have demonstrated that chemical composition and age also are nearly constant throughout the Taylor Creek Rhyolite. Our studies indicate that about 35 km^3 of Taylor Creek lava was emplaced from at least twenty vents within a region of about 800 km^2 during a period of less than 500,000 years (Du Bray and Duffield, 1987).

THE GEOLOGIC MAP

Eggleston (1987) was the first geologist to attempt subdivision of Taylor Creek Rhyolite into lava-flow units. Other workers may have been discouraged from such an effort because of the monotonous appearance of the rock in the field! Subdivision is one of the main tasks of our study; delineation of time-chemical composition-space trends during the growth of the rhyolite field and interpretation of the bedrock occurrences of cassiterite in terms of textural and structural zones of lava flows are possible only in the context of such subdivision. Our strategy has been to adopt a structural model for a silicic lava flow as we believe it would appear immediately after emplacement. This model is essentially the structural part (in contrast to the thermal part) of that proposed by Christiansen and Lipman (1966, Plate 4) for a Tertiary lava of comparable size and composition in Nevada. The principal elements of the model are (1) early pyroclastic deposits that represent an initial explosive phase of a typical eruption, (2) flow-generated breccia that envelopes the lava, and whose formation is analogous to that of a basaltic aa lava flow, and (3) a flow-foliated coherent interior (Fig. 1).

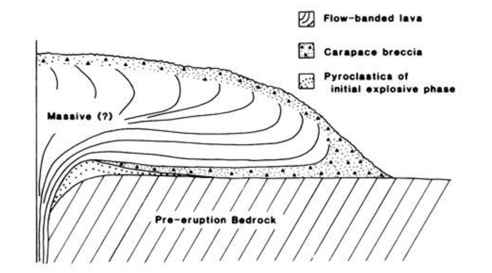

Figure 1. Structural model of an idealized rhyolitic lava flow. The relative volumes of the three principal elements may vary greatly from flow to flow. Most outcrops of Taylor Creek Rhyolite correspond to the flow-banded part of the model. Most carapace breccia has been removed by erosion, and pyroclastic deposits are partly eroded and inferred to be partly buried.

We interpret outcrops of Taylor Creek Rhyolite in terms of these three elements. Most outcrops correspond to the flow-foliated core of the model and provide little information about inter-flow contacts. The first-order pattern of this foliation is a potential tool for locating the contacts and vent of a flow, because it should parallel the contacts and focus on the vent. However, with the exception of map unit WHC, exposures are inadequate for local recognition and broader reconstruction of the first-order pattern. Pyroclastic deposits that formed during an initial explosive phase of some eruptions locally over- and underlie pairs of adjacent map units (e.g. BLP and DGC; BLP and AXP) and thus mark contact areas between lava flows. The most common evidence for inter-flow contacts is provided by remnants of the largely eroded carapace of flow breccia that is interpreted to have enveloped each flow before erosion began. Such breccia is preserved locally with 14 of the 20 mapped flows. Commonly, the breccia is crudely stratified, presumably as the result of repeated gravity-driven debris avalanches triggered along the steep margins of expanding and advancing flows; dips are generally about 30-35°, essentially the angle of repose, and thus consistent with the idea of gravity-driven avalanches. The orientation of the stratification permits one to assign isolated outcrops of breccia to parental lava flows (e.g. unit RWC) and to locate contacts within otherwise lithologically monotonous masses of breccia between two lavas (e.g. northwest part of contact between units BLP and AXP). Recognizing that the interpretation of the field data in terms of inter-flow contacts is not always unique, the basic map unit of the Taylor Creek Rhyolite is a lava flow/vent pair. Thus, 20 map units imply 20 vents, each of which produced a single lava flow and most or all of which produced pyroclastic material before the quiet effusion of lava began; for lavas without associated exposures of genetically associated pyroclastic deposits, we infer that the fragmental rocks are eroded or buried or both.

MODES

The phenocryst content of most Taylor Creek Rhyolite ranges from about 15% to 35% by volume (Fig. 2), and most phenocrysts are between 2 mm and 4 mm in diameter. Quartz and sanidine are by far the most abundant phases; oligoclase and altered mafic grains, which apparently were biotite and hornblende before alteration, generally are present in amounts somewhat less than 1.5% each. Within an estimated uncertainty of +-3% associated with modal counts, quartz and sanidine occur in equal amounts. The lavas with the greatest volume of phenocrysts also are statistically the coarsest grained.

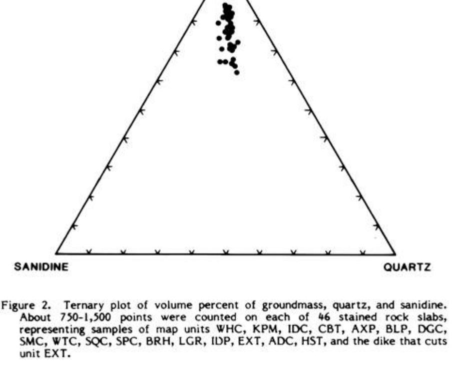

Figure 2. Ternary plot of volume percent of groundmass, quartz, and sanidine. About 750-1,500 points were counted on each of 46 stained rock slabs, representing samples of map units WHC, KPM, IDC, CBT, AXP, BLP, DGC, SMC, WTC, SQC, SPC, BRH, LGR, IDP, EXT, ADC, HST, and the dike that cuts unit EXT.

PETROGRAPHY AND CHEMISTRY

With rare exception, the groundmass of Taylor Creek lava consists of fine-grained spherulitic, plumose, and granophyric intergrowths of alkali feldspar and silica; these are the high-temperature devitrification products that formed during cooling of an initially glassy mesostasis. Vitric parts of the lavas are known at three localities, two of which are within flow breccia. Pyroclasts with glassy groundmass are present in several pyroclastic deposits of Taylor Creek Rhyolite. All of the glassy materials have undergone considerable secondary hydration; they are not fresh obsidian. However, the glasses contain phenocrysts of fresh biotite and hornblende, evidence that the altered counterparts in the lavas also were originally biotite and hornblende.

Locally, the lavas are bleached a stark white color and are unusually porous and friable. We interpret these rocks as marking zones of high permeability that served as major channelways for high-temperature degassing during initial cooling of the lavas. Such permeable zones presumably continued to function as channelways for a vapor phase until lavas cooled below boiling temperature. These porous parts of lavas are analogous to the zone of vapor-phase crystallization in welded ash flows as described by Smith (1960). Many constituents are transported in the vapor phase within the porous zones (Smith, 1960). Eggleston and Norman (1986) described overgrowths that double the original size of quartz phenocrysts in porous parts of the Taylor Creek Rhyolite. Because such mobility may change original rock chemistry, we collected only the densest parts of the lavas for chemical analyses, those parts that appear in hand sample and in thin section to have undergone little or no vapor-phase crystallization.

Major-element constituents of the dense samples apparently were immobile or nearly so during devitrification. All 14 of the Taylor Creek lavas analyzed to date contain about 77%-78% SiO_2 on a volatile-free basis (Table 1). Similarly, Al_2O_3, K_2O, and Na_2O vary little throughout the lava field; their variation and that of silica may mostly reflect analytical uncertainty. Some Na may have been removed during devitrification and subsequent percolation of groundwater through the lavas; samples with the highest content of water contain the least Na_2O. Remarkable major-element homogeneity throughout the lava field is indicated by extremely small standard deviations calculated for the average volatile-free composition of all samples (Table 1). Principal constituents of CIPW norms are quartz, orthoclase, and albite. Most norms include less than 2.0% corundum. The lavas are weakly peraluminous.

	WTC	EXT-1	EXT-2	SQC	SPC	BRH	LGR	WHC-1	WHC-2
SiO_2	78.10	77.78	77.50	77.56	78.00	78.51	78.40	77.87	77.89
TiO_2	0.15	0.12	0.12	0.15	0.18	0.14	0.14	0.15	0.15
Al_2O_3	12.02	12.33	12.45	12.13	11.74	11.85	11.73	12.10	11.75
Fe_2O_3	1.15	1.08	1.08	1.16	1.48	1.11	1.14	1.07	1.12
MnO	0.05	0.04	0.05	0.05	0.06	0.04	0.04	0.06	0.06
MgO	0.10	0.10	0.20	0.15	0.16	0.10		0.13	0.11
CaO	0.23	0.27	0.27	0.25	0.32	0.23	0.22	0.30	0.63
Na_2O	3.23	3.61	3.45	3.49	3.14	3.24	3.24	3.41	3.42
K_2O	4.95	4.64	4.84	5.03	4.89	4.75	5.05	4.90	4.86
P_2O_5	0.02	0.03	0.03	0.03	0.03	0.03	0.03		
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	WTC	EXT-1	EXT-2	SQC	SPC	BRH	LGR	WHC-1	WHC-2
Q	39.45	38.09	37.78	37.22	39.94	40.56	39.63	38.26	38.09
Or	28.95	27.17	28.31	29.58	28.69	27.78	29.66	28.80	28.69
Ab	27.12	30.26	28.94	29.37	26.41	27.17	27.23	28.69	28.93
An	1.00	1.14	1.14	1.04	1.39	0.94	0.89	1.49	2.33
Di									0.44
Hy	0.16	0.16	0.33	0.25	0.26	0.16		0.21	0.07
C	1.92	1.88	2.20	1.12	1.54	2.03	1.20	1.27	
Ap	0.04	0.07	0.07	0.07	0.07	0.07	0.07		
Il	0.11	0.09	0.11	0.11	0.13	0.09	0.09	0.13	0.13
Hm	1.14	1.08	1.08	1.16	1.47	1.11	1.14	1.07	1.13
Tn									0.20
Ru	0.09	0.07	0.06	0.09	0.11	0.09	0.09	0.08	
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	CBT-1	CBT-2	IDC	KPM	AXP	BLP	DGC	SMC
SiO_2	78.18	77.29	78.22	77.97	77.34	77.43	77.26	77.93
TiO_2	0.12	0.15	0.15	0.13	0.12	0.11	0.11	0.12
Al_2O_3	12.02	12.53	11.93	12.11	12.51	12.45	12.49	12.07
Fe_2O_3	1.04	1.00	1.21	1.05	1.07	1.07	1.05	1.13
MnO	0.06	0.06	0.03	0.05	0.06	0.05	0.04	0.04
MgO	0.14	0.14	0.17	0.20	0.12	0.11		0.15
CaO	0.30	0.31	0.31	0.40	0.24	0.19	0.22	0.21
Na_2O	3.19	3.51	2.99	3.03	3.64	3.77	3.92	3.56
K_2O	4.94	4.98	4.99	5.05	4.88	4.81	4.88	4.78
P_2O_5		0.02			0.02		0.03	0.02
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	CBT-1	CBT-2	IDC	KPM	AXP	BLP	DGC	SMC
Q	39.58	36.76	40.50	39.58	36.59	36.35	35.29	38.13
Or	28.95	29.21	29.18	29.59	28.62	28.24	28.68	28.04
Ab	26.80	29.46	25.04	25.46	30.58	31.66	33.00	29.94
An	1.49	1.40	1.50	1.95	1.05	0.94	0.89	0.91
Di								
Hy	0.23	0.23	0.28	0.33	0.20	0.18		0.25
C	1.73	1.69	2.11	1.86	1.67	1.40	0.88	1.40
Ap		0.04			0.04		0.07	0.04
Il	0.13	0.13	0.06	0.11	0.13	0.11	0.09	0.09
Hm	1.04	1.00	1.21	1.04	1.07	1.07	1.05	1.12
Tn								
Ru	0.05	0.08	0.12	0.07	0.05	0.05	0.06	0.07
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

	mean	standard deviation
SiO_2	77.84	0.10
TiO_2	0.14	0.00
Al_2O_3	12.13	0.07
Fe_2O_3	1.12	0.03
MnO	0.05	0.00
MgO	0.14	0.01
CaO	0.29	0.03
Na_2O	3.40	0.06
K_2O	4.90	0.03
P_2O_5	0.03	0.00
TOTAL	100.00	0.00

Table 1. Major-element compositions (recalculated to volatile-free basis), mean composition with standard deviation, and CIPW norms for Taylor Creek Rhyolite. Original analyses included 1.1-0.2 weight-percent volatiles lost on ignition at 900°C. Analyses by X-ray fluorescence techniques in U.S. Geological Survey laboratories at Menlo Park, CA, and Denver, CO. Analysts: J. Ardith, K. Bartel, T. Frost, J. Stewart, and J. Taggart.

The major-element homogeneity of whole-rock samples is reflected in the compositions of feldspar phenocrysts. Sanidine and oligoclase have been analyzed in samples from 6 of the map units (Table 2). None of the analyzed grains is compositionally zoned. Average compositions of the feldspars carry extremely small standard deviations, as was observed for the average whole-rock composition. Two-feldspar geothermometry indicates equilibration temperatures of 825-840°C at pressures of 1-2 kilobars (Du Bray and Duffield, 1987).

	WHC-1		WHC-2		WHC-3		WHC-4		WHC-5		CBT	
	San.	Olig.	San.	Olig.	San.	Olig.	San.	Olig.	San.	Olig.	San.	Olig.
SiO_2	66.23	64.62	66.28	64.79	66.13	64.00	66.29	63.88	67.39	65.03	66.51	65.97
Al_2O_3	19.39	22.09	19.37	21.50	20.16	22.75	19.19	22.69	18.69	21.01	18.63	20.64
Fe_2O_3	0.14	0.22	0.15	0.21	0.17	0.22	0.13	0.25	0.12	0.21	0.11	0.18
CaO	0.36	2.74	0.34	2.57	0.37	2.41	0.32	3.56	0.39	2.65	0.33	2.20
Na_2O	5.58	8.66	5.06	8.61	5.76	8.86	5.99	8.68	5.51	8.71	5.79	8.73
K_2O	8.31	1.80	8.69	1.89	7.87	1.96	7.63	1.25	8.06	1.61	7.85	2.09
Total	100.01	100.13	99.89	99.57	100.46	100.20	99.55	100.31	100.16	99.22	99.22	99.81

	IDC		KPM		DGC		AXP		Sanidine		Oligoclase	
	San.	Olig.	San.	Olig.	San.	Olig.	San.	Olig.	mean	S.D.	mean	S.D.
SiO_2	66.62	65.25	67.28	65.84	66.51	66.45	65.78	64.91	66.50	0.17	65.07	0.28
Al_2O_3	18.42	20.80	18.71	21.12	19.42	20.99	19.56	21.33	19.15	0.18	21.49	0.25
Fe_2O_3	0.13	0.21	0.11	0.20	0.12	0.18	0.14	0.16	0.13	0.01	0.20	0.01
CaO	0.35	2.69	0.32	2.52	0.34	2.20	0.33	2.15	0.34	0.01	2.57	0.14
Na_2O	5.76	8.86	5.46	9.03	5.72	9.01	6.90	9.36	5.75	0.16	8.85	0.08
K_2O	8.04	1.56	8.61	1.66	8.21	1.79	7.82	1.96	8.11	0.12	1.76	0.08
Total	99.32	99.37	100.49	100.37	100.32	100.62	100.53	99.87	99.99	0.16	99.95	0.15

Table 2. Major-element compositions and mean compositions with standard deviations for feldspar phenocrysts in Taylor Creek Rhyolite as determined by electron microprobe. Each tabulated analysis represents the average of three grains, each of which was analyzed at core, intermediate, and rim positions. Analyst: E. Du Bray.

Trace-element contents of whole-rock samples vary by as much as 50%. Such elements as Sc, U, Sb, and Cs show no recognizable trends on variation diagrams; these elements may have been mobile during devitrification, and their variability may mostly reflect this mobility. Ta, Th, Nb, Rb, and Ba (to a lesser extent) exhibit high degrees of correlation on X-Y plots (Fig. 3); these elements are interpreted to have been nearly immobile during devitrification. Elements that correlate positively with Rb and those that correlate negatively with Rb form the same pairs as those reported for the Bishop Tuff (Hildreth, 1979), a large-volume silicic ash-flow sheet quickly emplaced by geologically instantaneous tapping of a chemically stratified magma reservoir. This similarity suggests that the Taylor Creek Rhyolite also was erupted from a chemically stratified magma reservoir, and that perhaps the processes responsible for the statification were the same in both systems. However, such a suggestion must be tempered with the knowledge that Taylor Creek Rhyolite was emplaced from 20 vents distributed over an area of about 800 km^2 during a period that may have lasted 500,000 years. Moreover, the ratio of initial $^{87}Sr/^{86}Sr$ varies inversely with Rb content (Fig. 4), a relation opposite that for the Bishop Tuff (Hildreth, 1981).

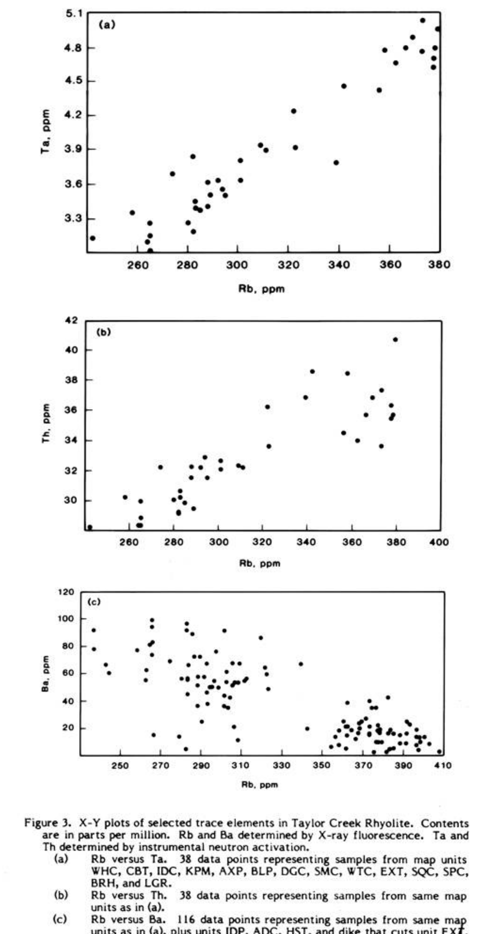

Figure 3. X-Y plots of selected trace elements in Taylor Creek Rhyolite. Contents are in parts per million. Rb and Ba determined by X-ray fluorescence. Ta and Th determined by instrumental neutron activation.
(a) Rb versus Ta. 38 data points representing samples from map units WHC, CBT, IDC, KPM, AXP, BLP, DGC, SMC, WTC, EXT, SQC, SPC, BRH, and LGR.
(b) Rb versus Th. 38 data points representing samples from same map units as in (a).
(c) Rb versus Ba. 116 data points representing samples from same map units as in (a), plus units IDP, ADC, HST, and dike that cuts unit EXT. The broad range of Ba values at relatively low Rb contents suggests that Ba may have been mobile and partly removed during devitrification.

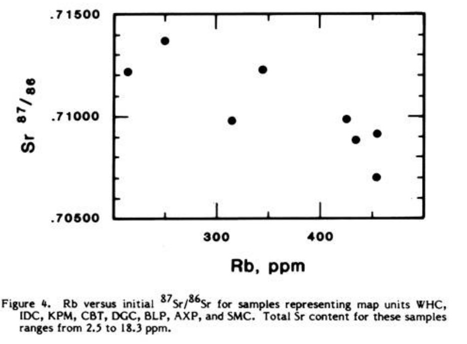

Figure 4. Rb versus initial $^{87}Sr/^{86}Sr$ for samples representing map units WHC, IDC, KPM, CBT, DGC, BLP, AXP, and SMC. Total Sr content for these samples ranges from 2.5 to 18.3 ppm.

The Taylor Creek situation is more closely analogous to that at Coso in California, where about 35 eruptions of high-silica rhyolite occurred within an area of 90 km^2 during a 250,000-year period (Duffield and others, 1980). The Coso rhyolite is homogeneous in major-element composition and exhibits the same correlations between Rb and other trace elements as the Bishop Tuff. Based principally on these chemical characteristics and analogy to the well studied Bishop magma system, Bacon and others (1981) concluded that the Coso magmas were serially tapped from a single reservoir stratified with regard to trace elements.

Our current working hypothesis is that the Taylor Creek magma also was erupted from a single, evolving, chemically stratified reservoir, and that periodic emplacement of a lava flow or a cluster of penecontemporaneous lava flows disrupted the system to the point that relatively mafic lower parts of the magma body were stirred into the upper silicic level and/or that jostled wall and roof rocks were assimilated. Thus, differences in trace-element chemistry may result from some combination of stirring, assimilation, and unspecified continuously operating fractionation processes. For example, in view of Sr contents as low as 3 parts per million (ppm), assimilation of only minor amounts of radiogenic crustal rocks could explain measured variations in Sr-isotope ratios.

BEDROCK CASSITERITE OCCURRENCES

Cassiterite in bedrock occurs primarily as open-space filling in veins that crosscut the flow-foliated rhyolite and secondarily as crystals on the walls of miarolitic cavities near the original outer margin of a flow. Most cassiterite-bearing veins are smaller than 1cm x 10m x 10m, and the veined areas are few and far between (see map). Almost all bedrock cassiterite is near or in outcrops of flow breccia. This structural zone within a newly emplaced lava flow is the site of extreme gradients in temperature, vapor pressure, and vapor composition, and is thus an ideal environment for mineral deposition during degassing and devitrification of a lava as it cools to ambient temperature. These characteristics suggest that the source of the Sn was the host lava itself (Lawrence, 1985; Duffield, 1987a).

Devitrified Taylor Creek Rhyolite contains from 1 to 5 ppm Sn, whereas Taylor Creek vitrophyre contains 6 to 8 ppm (Fig. 5). Correa (1981) and Ludington (written communication, 1986) reported Taylor Creek vitrophyre that contains 25 and 28 ppm Sn, respectively, but we have not yet been able to verify such high contents from rocks found during our mapping. Nonetheless, apparently at least 1 to 7 ppm Sn was released from the rhyolite during devitrification.

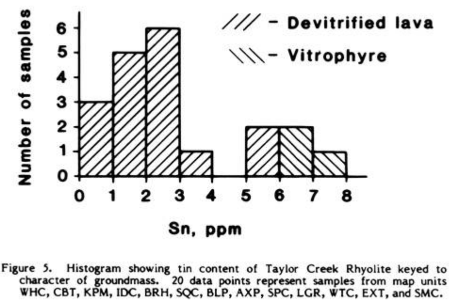

Figure 5. Histogram showing tin content of Taylor Creek Rhyolite keyed to character of groundmass. 20 data points represent samples from map units WHC, CBT, KPM, IDC, BRH, SQC, BLP, AXP, SPC, LGR, WTC, EXT, and SMC.

Maxwell and others (1986) estimated that 70,000 pounds of Sn has been mined from the Taylor Creek area and that about 10,000,000 pounds of Sn remains in unmined mineralized rocks. Mobilization of just 1 ppm Sn from 35 km^3 of rhyolite, the estimated volume of devitrified lava, would yield at least one order of magnitude more Sn than this estimated 10^7 pounds. If Sn was transported in a vapor-phase (perhaps as halogen complexes) that evolved during cooling and devitrification of the lavas and if most of this Sn was deposited in and near flow breccias, considerable cassiterite may have been dispersed with erosion of the breccias. Considerable Sn also may have been released to the atmosphere during vigorous lava fountaining, which characterized the initial phase of some eruptions (Duffield, 1987b), and at fumaroles rooted in cooling Taylor Creek lavas.

Lufkin (1976) reported cassiterite, pseudobrookite, bixbyite, and hematite together in miarolitic cavities of the Taylor Creek Rhyolite (map unit BLP); he concluded that these minerals grew from a vapor at a temperature of at least 500°C, on the basis of experimentally determined phase relations between pseudobrookite and bixbyite. Eggleston and Norman (1986) and Eggleston (1987) reported homogenization of fluid inclusions in cassiterite and associated gangue minerals in veins at temperatures ranging from about 750°C to 150°C. This wide interval is expectable if the evolving thermal environment was controlled by the cooling of a newly emplaced rhyolite lava. Presumably, the temperature at which Taylor Creek magma was erupted was not much lower than that at which its feldspar phenocrysts grew, about 830°C.

TENTATIVE CONCLUSIONS

The following conclusions are tentative, because our study is not yet complete. Queried contacts remain to be field checked; there is additional Taylor Creek Rhyolite to be mapped along the current northern limit of mapping; and such data as major- and minor-element analyses, modal analyses, radiometric ages, and Sr-isotope contents are lacking for several map units, including the most southerly three (RWC, RDM, and DMC). The limitations that this lack of data imposes on the following generalizations should be clear to the reader.

(1) The Taylor Creek Rhyolite was fed from a single reservoir of magma whose upper silicic part was homogeneous with respect to major- element composition. Differences in trace-element contents reflect periodic tapping of the continuously evolving, chemically stratified uppermost silicic part of this reservoir into which lower, less evolved parts of the magma body may have been stirred and wall and roof rocks may have been assimilated in response to disruptions of the system caused by the eruption of a lava flow or a cluster of penecontemporaneous lava flows. Twenty eruptions occurred during 500,000 or fewer years, a period that is consistent with the single-reservoir hypothesis.

(2) Taylor Creek magma contained at least 6-8 ppm Sn (and possibly much more), and at least 1-7 ppm Sn were mobilized during degassing and devitrification of lava flows as they cooled to ambient temperature. This amount of mobilized Sn, from an estimated source volume of 35 km^3 of lava, is equivalent to at least one order of magnitude more Sn than has been mined and is in unmined, mineralized parts of the Taylor Creek Rhyolite.

(3) Sn was initially deposited at about 700°C in and near the outer flow-brecciated rind of each newly emplaced lava flow, where extreme gradients in temperature, vapor pressure, and vapor composition were present. Sn deposition continued as a lava flow cooled, and some Sn may have been redistributed during hydrothermal convection as the inward migration of the boiling-point isotherm resulted in replacement of a vapor-dominated environment with a hot-water environment.

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DESCRIPTION OF MAP UNITS

Uy — ***Undifferentiated rocks and unconsolidated deposits younger than Taylor Creek Rhyolite (Quaternary and Tertiary)***— Includes alluvium and colluvium; a variety of silicic pyroclastic rocks emplaced from vents distant from the Taylor Creek area; and mafic, intermediate, and silicic lava flows emplaced from vents near onlapped lavas of Taylor Creek Rhyolite. Additional information about these rocks and deposits can be found in Richter and others (1986a), Richter and others (1986b), Richter (1978), Lawrence and Richter (1986), and Eggleston and Norman (1983).

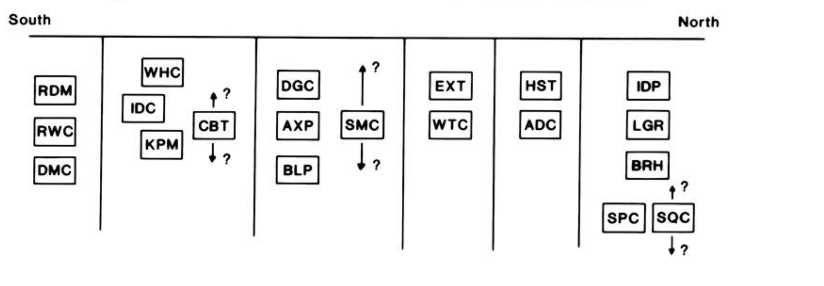
* ***Taylor Creek Rhyolite (Oligocene)*** - Moderately porphyritic, flow-foliated rhyolite lava. Consists of 20 separately mapped flow units, each of which is interpreted to have been emplaced from its own vent. Locally includes monolithologic rhyolite flow breccia (stippled) and variably welded agglutinate (triangles). Locally crosscut by small cassiterite-bearing veins.

Utcp — ***Undifferentiated pyroclastic deposits of Taylor Creek Rhyolite (Oligocene)*** - Includes pyroclastic flows, surge deposits, and fall-out deposits. Occurs in beds as thin as a few centimeters and as thick as several meters. Poorly consolidated at most localities; a few fall-out deposits are densely welded. Indicated on map only where in contact with Taylor Creek Rhyolite lava. Local age relations to lava are variable, indicating multiple cycles of pyroclastic to quietly effusive eruption of Taylor Creek magma.

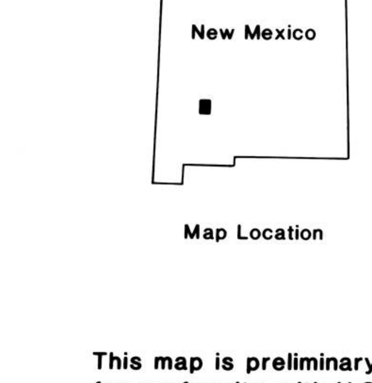
Uo — ***Rhyolite older than Taylor Creek Rhyolite (Oligocene)*** - Aphyric and plagioclase-phyric rhyolite lavas. Consists of rhyolite of Hoyt Creek (Thr) and rhyolite of Whitetail Canyon (Twr) of Richter and others (1986a)

* See correlation chart

CORRELATION OF MAP UNITS OF TAYLOR CREEK RHYOLITE



Note: Relative ages of most map units that overlap are constrained by field relations. Relative ages of non-overlapping units are unknown.



Map Location

Base from U.S. Geological Survey 1:24,000 Baily Points (1981), Indian Peaks East (1981), Indian Peaks West (1981), Sawmill Peak (1981), Spring Canyon (1967), Taylor Peak (1981), Wahoo Peak (1981), and Wall Lake (1967), New Mexico.

PRELIMINARY GEOLOGIC MAP OF THE TAYLOR CREEK RHYOLITE, CATRON AND SIERRA COUNTIES, NEW MEXICO

by

Wendell A. Duffield, Donald H. Richter and Susan S. Priest

1987

This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.